

Two newly described species and a draft key to the species of *Sida* s. lat. from Western Australia

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Abstract

Barker, R.M. Two newly described species and a draft key to the species of *Sida* s. lat. from Western Australia. *Nuytsia* 17: 13–30 (2007). There are a number of new native species of *Sida* listed in the Western Australian Herbarium's FloraBase that have not yet been formally described. Of the 56 accepted species names presently listed, nearly half represent undescribed taxa. These are cited as either manuscript or phrase names. Two of the species, *Sida ectogama* W.R.Barker & R.M.Barker and *Sida arsiniata* R.M.Barker, previously known by phrase names, are here described and a draft key is provided for the native species of *Sida* found in Western Australia.

Introduction

A request was made by the Western Australian Herbarium (PERTH) to formalise some known, but as yet undescribed, species of Priority and Declared Rare Flora, with a specific emphasis on taxa from areas of mining interest. The taxa known in FloraBase as *Sida* sp. Unisexual (N.H. Speck 574) and *Sida* sp. Wittenoom (W.R. Barker 1962) were specifically targeted from the genus *Sida* L., which for some years has been under revision in Australia by the author. From annotations on herbarium specimens botanists had been aware of both species since the 1960s; they have had a number of informal names since that time. They are formally named herein as *S. ectogama* W.R.Barker & R.M.Barker and *S. arsiniata* R.M.Barker, respectively.

Generic placement of the new species

Although the taxa have been known for some time their generic placement is still being resolved. In the strict sense the genus *Sida* is confined to species of sect. *Sida* defined by a 10-ribbed calyx and by mericarps in which the upper dehiscent portion is separated from the indehiscent lower portion by a shoulder (Fryxell 1985; see R.M. Barker 1998 for an account of the Australian species); these findings are supported by molecular work in progress by John Beck (pers. comm., 15 Dec. 2005) in the laboratory of Randall Small at the University of Tennessee. Thus far, however, the placement of the rest of the Australian *Sida* species remains problematic.

Their closest relationships appear to be with the American genus *Sidastrum* Baker f., as originally suggested by Fryxell (1985), but the present author felt that more supporting evidence was needed

before this transfer was made, particularly as some of the morphological traits exhibited by Australian species were found in other American genera such as *Krapovickasia* Fryxell and *Meximalva* Fryxell. Earlier molecular studies (Fuentes Aguilar *et al.* 2003; Tate *et al.* 2005) included only three native Australian species, *Sida fibulifera* Lindl., *S. platycalyx*¹ F.Muell. ex Benth. and the atypical² *S. hookeriana* Miq., and so were unhelpful in determining placement; both of these studies placed *S. platycalyx* and *S. fibulifera* as sister to the *Sidastrum* + *Meximalva* clade. However, molecular studies undertaken by Beck have included samples of 13 Australian species. The results suggest that they are a monophyletic group, sister to *Sidastrum*. Whether they eventually become a new genus or are included within *Sidastrum* awaits the results of further work.

Relationships of the new species

Both of the species described below have distinctive morphologies and their relationships are relatively clear-cut. Thus *S. ectogama* is most closely related to the Queensland species, *S. asterocalyx* S.T.Reynolds & A.E.Holland, and *S. arsinjata* is most closely related to the Western Australian species, *S. echinocarpa* F.Muell. and *S. kingii* F.Muell. Because there are only regional treatments for *Sida* in Western Australia (Wheeler 1992; Grieve 1998) and no comprehensive treatment of all of the species, the best way to present a context for them is by providing a draft key. For some years, a number of collectors in Western Australia have had access to a draft annotated key by the author specifically for the Pilbara region and a similar key has also recently been provided for the Kimberley region. This latter area is a lot more problematic for distinguishing between taxa and an understanding of some of the members of the *Sida macropoda* F.Muell. ex Benth. complex of the sandstone regions of the "Top End" is still to be achieved.

Notes on the key to species of *Sida* in Western Australia

The key below contains both formally and informally named species. The latter have been referred to by pre-existing standardised phrase names (W.R. Barker 2005), some of which been taken from the latest Northern Territory census (Kerrigan & Albrecht 2007) rather than generating new phrase names with a Western Australian voucher (e.g. *S. sp.* Petermann Ranges (B.G. Thomson 2340) and *S. sp.* Wakaya Desert (P.K. Latz 11894)). Whilst *S. sp.* Marandoo (M.E. Trudgen 10976), *S. sp.* Pilbara (S. van Leeuwen 4377) and *S. sp.* Shovelanna Hill (S. van Leeuwen 3842) are currently recognised on FloraBase (Western Australian Herbarium 1998–), they are not included in the key since their taxonomic status is uncertain. *Sida petrophila* F.Muell. is similarly omitted since its occurrence in Western Australia requires validation. Broad distributions of the species are indicated in the key, often with reference to their main IBRA region occurrence (Interim Biogeographic Regionalisation for Australia: Thackway & Cresswell 1995; Western Australian Herbarium 1998–; Department of the Environment and Water Resources 2007).

Vegetatively the species of *Sida* are often difficult to distinguish, particularly as the weather conditions appear to influence the colour of the indumentum developed by a plant. For this reason the key relies fairly heavily on floral and fruit characters, particularly those of the fruit. Mericarp number

¹ Listed as *S. physocalyx* in the cladograms of Fuentes Aguilar *et al.* (2003) – this is presumably a mistake for *S. platycalyx* since this species is listed in the voucher information.

² These molecular studies placed *S. hookeriana* near the *Plagianthus* group which supports this author's observations, based on morphology, that *S. hookeriana* is closer to *Lawrencia berthae* (F.Muell.) Melville than to native Australian species of *Sida*.

is frequently of great diagnostic importance and the absence of fruits on a collection may make it impossible to achieve specific identification. In the absence of fruits it should be borne in mind that the number of styles equals the number of carpels and in the majority of cases the style number can be taken to equal the mericarp number. In a few cases where there are unisexual plants e.g. *S. ectogama* and *S. sp. spiciform* panicles (E. Leyland s.n. 14/8/90), some of the carpels abort or are not fertilised but they are usually still discernible in their squashed form in the schizocarp.

True glandular hairs do not occur in *Sida*. However, simple, curled, ?multicellular hairs which appear to be of a glandular nature are often present on the mericarps (e.g. *S. calyxhymenia* J.Gay ex DC., *S. arsiniata*, *S. macropoda s. lat.*), more rarely on the pedicels (*S. trichopoda* F.Muell. and *S. sp. Excedentifolia* (J.L. Egan 1925)) and on the leaves (*Sida sp. Excedentifolia* (J.L. Egan 1925)). When occurring on the mericarps these hairs are scattered and the mericarps are described as being "puberulent" or "glandular puberulent". The presence of these hairs is frequently diagnostic, but their presence usually has to be confirmed using a low power microscope.

Most native Australian species of *Sida* have bisexual flowers on the one bush, i.e. flowers have functional anthers on the staminal column and styles elongating with time up through the staminal column, eventually exceeding it and then finally recurving to become mixed in with the stamens. A few species, however, are dioecious, amongst them *S. ectogama* and *S. asterocalyx*. In these species flowers produced on a bush are either functionally male or female; in male flowers the stamens develop normally but there is no associated development of the styles, while in female flowers the styles extend through a staminal column which bears depauperate anthers bereft of pollen (see Figure 1C).

Calyx lobe measurement refers only to the part which is free.

Key to species of *Sida* in Western Australia

- 1. Leaves deeply divided [mericarps 8–11, glabrous; SW WA].....**S. hookeriana** Miq.
- 1: Leaves entire, not divided 2
- 2. Calyx 10-ribbed at base [*S. acuta* Burm.f., *S. cordifolia* L.,
S. pusilla Cav., *S. rhombifolia* L., *S. rohlenae* Domin,
S. spinosa L., *S. subcordata* Span.] **Sida sect. Sida**¹
- 2: Calyx sometimes ribbed, but not 10-ribbed at base 3
- 3 Plants with lepidote scales.....4
- 3: Plants lacking lepidote scales5
- 4. Mericarps 13–15, glabrous [disjunct specimens of this Qld
species have been found in WA in the Sturt Creek area].....**S. spenceriana** F.Muell.
- 4: Mericarps 7–9, pubescent [the hairs on one of the forms of
S. trichopoda sometimes approach the lepidote condition; as
with *S. spenceriana* they usually occur in black cracking clay
areas in northern WA].....**S. trichopoda** F.Muell. *p.p.*
- 5. Calyx 16–30-ribbed; mericarps 13–26, remaining fused
together in a ring and still present at the base of new
plants [widespread, central Australia] **S. platycalyx** F.Muell. ex Benth.
- 5: Calyx not ribbed; mericarps less than 13 or if more,
eventually dissociating from each other 6

¹ See Barker (1998) for a key to the species of *Sida* sect. *Sida*.

6. Calyx remaining closed in flower and fruit 7
- 6: Calyx not closed over flower or fruit although
sometimes longer than them 8
7. Flowers 1 or 2 per axil; calyx very inflated in fruit, balloon-like;
mericarps 10–12, pubescent; stamens 10–20 [Kimberley] **S. cleisocalyx** F.Muell.
- 7: Flowers 4 or 5 per axil; calyx not markedly inflated in
fruit; mericarps 7–9, glabrous; stamens 10 [Kimberley].... **S. sp. C Kimberley Flora** (T.E.H. Aplin 4982)
8. Calyx much inflated in fruit, membranous or papery 9
- 8: Calyx often larger in fruit but not membranous or papery 13
9. Calyx 15–25 mm long; mericarps 10–17, glabrous;
flowers bisexual [Hamersley Ranges to Meekatharra] **S. brownii** Clement
- 9: Calyx 5–15 mm long; mericarps 6–8, glabrous or pubescent;
flowers unisexual and/or bisexual on one plant 10
10. Fruits pubescent, mericarps not all equally developed;
flowers usually male or female on one bush 11
- 10: Fruits glabrous or sparsely glandular puberulent, mericarps
all equally developed; flowers always bisexual 12
11. Flowers 7–11 mm diameter; stamens and stigmas
exserted [mostly in the Murchison] **S. ectogama** W.R.Barker & R.M.Barker *p.p.*
- 11: Flowers 20–28 mm diameter; stamens and stigmas
included [SW Qld] **S. asterocalyx** S.T.Reynolds & A.E.Holland
12. Calyx lobes not yellow, dark in colour because of stellate hair
colour; mericarps 5, glandular puberulent; corolla lobes often
ciliate whole length [Pilbara through to Eyre Peninsula in SA] **S. calyxhymenia** J.Gay ex DC.
- 12: Calyx lobes yellow; mericarps usually 5 and glabrous, rarely
7 or 8 and with glandular puberulence; corolla lobes ciliate
only on claw [Pilbara] **S. clementii** Clement
13. Mericarps spiny 14
- 13: Mericarps not spiny, but sometimes corrugated 16
14. Free part of calyx lobes 10–14 mm long in fruit, 5–7 mm in flower;
mericarps 11–14, glabrous [predominantly in Pilbara with occasional
specimens across to NT and one specimen from NT] **S. echinocarpa** F.Muell.
- 14: Free part of calyx lobes up to 6 mm long in fruit, 3–4.5 mm in flower;
mericarps 9–12, pubescent or puberulent 15
15. Calyx lobes truncate; mericarps 9 or 10, puberulent; shrub [Pilbara] **S. arsiniata** R.M.Barker
- 15: Calyx lobes acute; mericarps 11 or 12, pubescent; prostrate creeper
to decumbent shrub [Cape Range to Geraldton] **S. kingii** F.Muell.
16. Mericarp number 10 or more 17
- 16: Mericarp number less than 10 20
17. Mericarps glabrous or with glandular puberulence [calyx lobes
with 3–5 longitudinal lines, far exceeding fruit, c. 15–18 mm long;
Carnarvon area] **S. sp. Carnarvon** (P.S. Short 2492)
- 17: Mericarps pubescent 18
18. Pedicel exceeding subtending leaf [mericarps 9–10;
NT, Qld and Nicholson Stn in WA] **S. sp. Supplejack Station** (T.S. Henshall 2345)
- 18: Pedicel less than subtending leaf 19

19. Mericarps 6–10, deeply corrugated; buds often 5-angled
[some specimens from Cape Range and Dirk Hartog Island have
been referred here in the past, but it is likely that true *S. corrugata*
does not occur in WA; it is widespread in SE Australia] ***S. corrugata*** Lindl.
- 19: Mericarps 9–13, coarsely wrinkled; buds
not 5-angled [Kimberley] ***S. brachypoda*** A.E.Holland & S.T.Reynolds *p.p.*
20. Mericarp number less than 5; flowers clustered **21**
- 20: Mericarp number 5–9; flowers clustered or not **22**
21. Venation obscure; basal branches lacking leaves,
black [Petermann Ranges] ***S. sp. Petermann Ranges*** (B.G. Thomson 2340) *p.p.*
- 21: Venation obvious; basal branches leafy,
not black [central Australia] ***S. cardiophylla*** F.Muell.
22. Mericarps glabrous or sparingly glandular puberulent **23**
- 22: Mericarps pubescent **38**
23. Mericarp number always 5 **24**
- 23: Mericarp number 5–9, if 5 then variable on bush **30**
24. Plant glabrescent, prostrate; fruit rounded, very
thin-walled, smooth [leaves tiny, 2–28 × 3–7 mm;
mericarps glabrous or puberulent] ***S. sp. tiny glabrous fruit*** (A.A. Mitchell PRP 1152)
- 24: Plant not glabrescent, prostrate or not; fruit with
raised apex, not thin-walled, usually at least partly
with reticulate markings on dorsal surface **25**
25. Corolla lobes ciliate over whole length; calyx lobes
thinner and inflated in fruit, appearing dark in colour because
of stellate hair colour; mericarps puberulent [Pilbara,
S to Eyre Peninsula in SA] ***S. calyxyhymenia*** J.Gay ex DC.
- 25: Corolla lobes ciliate only on claw; calyx lobes not thinner
although they may be larger in fruit, not dark-coloured;
mericarps glabrous or puberulent **26**
26. Pedicel very slender, exceeding subtending leaf; mericarps
puberulent [Kimberley] ***S. macropoda*¹ complex** *p.p.*
- 26: Pedicel not excessively slender, less than subtending leaf;
mericarps glabrous **27**
27. Calyx lobes not exceeding fruit **28**
- 27: Calyx lobes exceeding fruit **29**
28. Fruits dark green; mericarps not or hardly grooved at apex;
plants of limestone areas [southern Australia] ***S. spodochroma*** F.Muell. *p.p.*
- 28: Fruits dark brown; mericarps deeply grooved at apex; plants of
sandy areas [occurrence in WA in need of confirmation] ***S. ammophila*** F.Muell. ex J.H.Willis
29. Calyx lobes not 5-angled in bud; dense shrub to 80 cm high;
leaves obovate, broadly obovate or circular [Pilbara] ***S. sp. Pilbara*** (A.A. Mitchell PRP1543)
- 29: Calyx lobes 5-angled in bud; spindly shrub up to 3 m high;
leaves narrowly oblong to ovate [southern Kimberley
to Pilbara] ***S. arenicola*** S.T.Reynolds & A.E.Holland
30. Pedicel exceeding subtending leaf **31**
- 30: Pedicel less than subtending leaf **34**

¹ The previous name for this species, *S. virgata* Hook., is predated by *S. virgata* Cav. The next available name seems to be *S. macropoda* F.Muell. ex Benth. Elements of this complex have been referred to as *Sida* sp. A Kimberley Flora (P.A. Fryxell & L.A. Craven 3900) in FloraBase.

31. Leaves with glandular puberulence mixed with rest of hair covering [pedicels 15–25 mm long, also with some glandular puberulence; drier areas, central WA] **S. sp. Excedentifolia** (J.L. Egan 1925) 32
- 31: Leaves lacking glandular puberulence 32
32. Fruit dark green, often with glistening wart-like glands on outer surface [plant prostrate or sprawling, with noticeably black pedicels in WA populations; Pilbara to Alice Springs] **S. sp. verrucose glands** (F.H. Mollemans 2423) *p.p.*
- 32: Fruit glabrous or with glandular puberulence, lacking wart-like glands [plant erect] 33
33. Shrub to 75 cm high; leaves 6–20 mm long; pedicel 14–20 mm long in fruit [stony hills in drier areas south of the Pilbara] **S. sp. Golden calyces glabrous fruit¹** (H.N. Foote 32)
- 33: Shrub to 200 cm high; leaves 50–90 mm long; pedicel 20–40 mm long in fruit [Kimberley] **S. macropoda complex** *p.p.*
34. Petals 7–10 mm long; buds noticeably acute or acuminate [mericarps 7 or 8, aging to dark-brown, glabrous; foliage with a felted appearance; rounded shrubs in skeletal soils of cliff faces of Barlee Range to Tom Price in Pilbara] **S. sp. Barlee Range** (S. van Leeuwen 1642)
- 34: Petals less than 7 mm long; buds not noticeably acute or acuminate [mericarps not dark brown or if so, with verrucose glands] 35
35. Fruits dark brown with verrucose glands on outer surface [erect shrubs; mericarps 6 or 7; predominantly known from NT populations but occasional specimens from Wiluna and Halls Creek regions of WA suggesting a wider distribution] **S. sp. Wakaya Desert** (P.K. Latz 11894)
- 35: Fruits dark-coloured, usually dark-green, with or without verrucose glands, but if these are present the plants are prostrate and with very long pedicels 36
36. Fruits with 5 or 6 mericarps, glabrous; small blue-grey shrubs [limestone areas, southern Australia] **S. spodochroma** F.Muell. *p.p.*
- 36: Fruits with 6–10 mericarps, glandular puberulent or with verrucose glands; plants not blue-grey 37
37. Spreading shrub; leaves narrowly-oblong, dark green and velvety above, apically truncate; mericarps 7 or 8(–10), sparingly glandular puberulent [Pilbara, Murchison River, Geraldton, inland to SA border] **S. sp. dark green fruits** (S. van Leeuwen 2260)
- 37: Prostrate or sprawling plants; leaves ovate or oblong, yellowish green above, apically rounded or acute; mericarps 6 or 7, covered with rounded verrucose glands [Pilbara south to Kalgoorlie, inland to SA border and Alice Springs] **S. sp. verrucose glands** (F.H. Mollemans 2423) *p.p.*
- 38 Mericarps always 5 per fruit 39
- 38: Mericarps variable, 5–10 per fruit 48
39. Calyx inflated in fruit; flowers unisexual; stamens and style exerted; fruits with mericarps often developing unequally [spindly shrubs always growing under other vegetation; predominantly found in the Murchison] **S. ectogama** W.R.Barker & R.M.Barker *p.p.*

¹There are two taxa included within *Sida* sp. golden calyces and consequently two different vouchers; glabrous fruit has been added to the phrase name here to distinguish between those specimens with glabrous fruits and those with pubescent fruits.

- 39: Calyx not markedly inflated in fruit; flowers in the main bisexual; stamens and style included (if flowers unisexual and style exerted, inflorescence paniculate); fruits with mericarps developing equally.....40
- 40: Calyx lobes exceeding fruit [buds 5-angled above]41
- 40: Calyx lobes not exceeding fruit.....43
- 41: Fruit very thin-walled, fragile mericarps; flowers solitary or paired in axils; leaves up to 25 mm long [red sand, usually associated with spinifex, also in pindan vegetation of Dampierland; WA, NT, NSW]**S. sp. B Kimberley Flora** (A.A. Mitchell 2745)
- 41: Fruit with robust mericarps; flowers clustered in axils; leaves up to 65 mm long.....42
- 42: Stipules with glandular puberulence; pedicel 9–15 mm long, articulated in upper half; flower clusters erect [rocky hills, central Australia]**S. phaeotricha** F.Muell.
- 42: Stipules lacking glandular puberulence; pedicel 6–9 mm long, articulated in lower half; flower clusters pendent [sand dunes of central Australia, including deserts of WA]**S. sp. sand dunes** (A.A. Mitchell PRP1208)
- 43: Flowers in terminal leafless panicles; tall spindly shrubs [watersheds of the Pilbara, Gascoyne and Great Sandy Desert; there are at least 2 taxa]**S. sp. spiciform panicles** (E. Leyland s.n. 14/8/90) *p.p.*
- 43: Flowers solitary, clustered, racemose or spicate, not paniculate; tall spindly shrubs or small spreading shrubs44
- 44: Stipules glandular puberulent; pedicels 9–15 mm long; flowers clustered [central Australia]**S. phaeotricha** F.Muell. (*cryphiopetala* form)
- 44: Stipules not glandular puberulent; pedicels up to 8 mm long; flowers solitary, racemose or spicate45
- 45: Fruit not raised in centre, usually very thin-walled; mericarps not noticeably grooved apically, seed not exposed46
- 45: Fruit with a decided peak, robust; mericarps deeply grooved apically and exposing top of seed [small grey shrubs with narrow leaves, in sand; SA, Vic, NT]..... **S. ammophila** F.Muell. ex J.H.Willis
- 46: Flowers subsessile, crowded in spikes [tropical coastal and river areas; WA, NT, Qld].....**S. hackettiana**¹ W.V.Fitzg.
- 46: Flowers pedicellate, solitary or racemose47
- 47: Plants prostrate; leaves 10–25 mm long, narrowly ovate or oblong [leaf apex usually truncate; sand deserts from Hamersleys through to Simpson; WA, NT and SA] **S. sp. Rabbit Flat** (B.J. Carter 626)
- 47: Plants erect; leaves 3–9 mm long, ovate to sub-circular [southern Australia]**S. intricata** F.Muell.
- 48: Pedicel exceeding subtending leaf [look for fruiting pedicels].....49
- 48: Pedicel not exceeding subtending leaf53
- 49: Pedicel glabrescent.....50
- 49: Pedicel pubescent51
- 50: Calyx, upper pedicel and mericarps lacking glandular puberulence; fruit not reticulately marked on dorsal surface, apically rounded, deeply grooved between mericarps; mericarps never winged [black cracking clays, Kimberley]..... **S. laevis** Domin

¹The previous name for this species, *S. subspicata* F.Muell. ex Benth., was predated by *S. subspicata* Colla.

- 50: Calyx, upper pedicel and mericarps with glandular puberulence mixed with stellate hairs; fruit with reticulate markings on dorsal surface, flat-topped or with small central apex, not grooved between mericarps; mericarps with lateral wings or not [widespread in Australia; in WA associated with drainage lines of the Pilbara] **S. trichopoda** F.Muell.
51. Fruits with 8 or more mericarps [mericarps very corrugated and very densely and evenly pubescent; NT, Qld, and 2 WA collections from Nicholson and Karijini] **S. sp. Supplejack Station** (T.S. Henshall 2345)
- 51: Fruits with 6 or 7 mericarps 52
52. Fruit raised in centre, covered with non overlapping stellate hairs, lacking glandular puberulence [sand dunes; near junction of WA, SA and NT borders, occurring as far west as Newman and Wiluna, as far east as the George Gill Range area] **S. sp. Golden calyces**¹ (G.J. Leach 1966)
- 52: Fruit flat, rounded, covered with overlapping stellate hairs mixed with glandular puberulence [sandstone; Kimberley and NT] **S. macropoda complex**
53. Calyx larger than fruit, spreading and not enclosing fruit; flowers unisexual 54
- 53: Calyx similar size to fruit, enclosing fruit, at least on base and sides; flowers unisexual or bisexual 55
54. Stamens and stigmas exerted; flowers 7–11 mm diameter [spindly shrubs always growing under other vegetation; predominantly found in the Murchison] **S. ectogama** W.R.Barker & R.M.Barker *p.p.*
- 54: Stamens and stigmas included; flowers 20–28 mm diameter [SW Qld] **S. asterocalyx** S.T.Reynolds & A.E.Holland
55. Flowers clustered in the axils 56
- 55: Flowers solitary, cymose or racemose 60
56. Leaves wider than long or \pm circular 57
- 56: Leaves longer than wide 58
57. Flowers always bisexual, 1–9 per axil; pedicels 1.5–3.5 mm long [sand dunes; Carnarvon and Yalgoo] **S. sp. Pindar** (A.Mitchell 3585)
- 57: Flowers mostly unisexual, (1–)3–5 per axil; pedicels 2–8 mm long [older branches leafless and blackish; Petermann Ranges only, but with some outliers showing a tendency to this species] **S. sp. Petermann Ranges** (B.G. Thomson 2340) *p.p.*
58. Fruits not raised in centre; mericarps 7 or 8; leaves narrowly-ovate [Kimberley] **S. sp. Articulation below** (A.A. Mitchell PRP1605)
- 58: Fruits raised in centre; mericarps 5, or if 6 or 7 leaves ovate 59
59. Flowers in terminal, almost leafless, panicles; fruit rounded; corolla longer than calyx [watersheds of the Pilbara, Gascoyne and Great Sandy Desert; there are at least two taxa] **S. sp. spiciform panicles** (E. Leyland s.n. 14/8/90) *p.p.*
- 59: Flowers in clusters in axils, each cluster subtended by a leaf; fruit conical; corolla shorter or similar length to calyx [sand dunes, central Australia] **S. sp. sand dunes** (A.A. Mitchell PRP1208)

¹There are two taxa included within *Sida* sp. golden calyces and consequently two different vouchers; the words 'glabrous fruit' have been added to one of the phrase names to distinguish between taxa with glabrous fruits and those with pubescent fruits.

60. Flowers cymose or racemose [fruits smooth or somewhat corrugated, 3.5–6.5 mm diameter, deeply grooved between mericarps; mericarps 7 or 8, ± entire at apex; widespread and variable across Australia, undoubtedly containing a number of entities] ***S. fibulifera*** Lindl.
- 60: Flowers solitary **61**
61. Spreading woody shrub; calyx exceeding fruit; corolla similar length to calyx; flowers often unisexual [Petermann Ranges only but with some outliers showing a tendency to this species] ***S. sp. Petermann Ranges*** (B.G.Thomson 2340) *p.p.*
- 61: Herbs, often prostrate, sprawling, not markedly woody; calyx enclosing fruit base and sides, not exceeding it; corolla longer than calyx; flowers bisexual **62**
62. Stipules lanceolate, 0.3–1.4 mm wide; buds 5-angled; leaves deeply crenate [some specimens from Cape Range and Dirk Hartog Island have been referred here in the past, but it is likely that true *S. corrugata* does not occur in WA] ***S. corrugata*** Lindl.
- 62: Stipules filiform, to 0.2 mm wide; buds not 5-angled; leaves crenulate [Kimberley] ***S. brachypoda*** A.E.Holland & S.T.Reynolds *p.p.*

Two new species of *Sida* in Western Australia

Sida ectogama W.R.Barker & R.M.Barker, *sp. nov.*

Species nova *S. asterocalycis* Queenslandicae affinisima matrimonio polygamo, calycibus accrescentibus, in fructu lobis latis, deltoideis, breve acuminatis et schizocarpio modificato per carpella radiata paene libera sed in toto exuta; differt stylis lobisque corollae brevioribus et staminibus stylisque exsertis.

Typus: top of Von Treuer Tableland, Western Australia, 14 September 1979, *H.R. Toelken* 6149 (*holo*: AD; *iso*: PERTH).

Sida calyxhymenia var. *ferruginea* Pritzel, in F.L.E. Diels & E. Pritzel, Bot. Jahrb. Syst. 35: 362 (1904); Domin, Biblioth. Bot. 89: 389 (1928); Clement, *Contrib. Gray Herb. Harvard* 180: 42 (1957) *p.p.* (at least with respect to *Gardner* 2263 and possibly other specimens in K not seen by the author). *Type*: pr. Murrinmurrin, 1902, *W.J. George s.n.* [as 1902 in Clement] (not located); pr[ope]. Cue, fl. m. Jun D[iels] 3269 (PERTH).

Sida asterocalyx *auct. non* S.T. Reynolds & A.E.Holland, *Austrobaileya* 2(5): 463 (1988) *p.p.* (only with respect to *Wilson* 7551).

Sida calyxhymenia *auct. non* J.Gay ex DC., in J.S. Beard, *Descr. Cat. West. Austral. Plants*, 2nd ed.: 85 (1965) *p.p.*

Sida sp. Unisexual (N.H. Speck 574), in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 293 (2000).

Sida ciliata N.T.Burbidge ms, *in sched.*

Sida hirsutiflora Fryxell ms, *in sched.*

Sida sp. I, W.R. Barker, unpublished revised treatment of *Sida* for Flora of Central Australia.

Twiggy perennial shrubs, 30–200 cm tall, usually dioecious, rarely hermaphrodite, covered with dense yellowish-red-brown sessile or stalked stellate hairs when young, these sparser with age. *Leaves* alternate, discolorous, petiolate with blade ovate or elliptic, 2.5–5 times petiole length, 8–25 × 4–13 mm, base rounded, margin crenulate, apex truncate or rounded; upper surface dark olive green, pale green below; indumentum above and below of dense colourless, sessile, stellate hairs; venation reticulate, obscure above, raised below; petiole 1–5 mm long, indumentum similar to that on leaves. *Stipules* narrowly triangular, 1.5–2.8 mm long, only present in very young parts. *Inflorescence* in upper leaf axils or in axils of short shoots, 1 or 2-flowered; flowers usually unisexual, more rarely bisexual on any one bush. *Pedicel* 5–13 mm long in flower and fruit, articulated in upper half, with dense, sessile, stellate hairs above and below; upper part deciduous with calyx, lower part persistent. *Bud* globose, 5-winged at apex, erect. *Calyx* widely and shallowly cup-shaped in open flower, larger and persistent in fruit, becoming somewhat papery with age, remaining splayed out and not enclosing fruit, longitudinally lined; lobes 5–6 mm long and 4–5 mm wide in flower, 9–10 mm long in fruit, depressed ovate, united above half way but not for whole length, apex acute or acuminate; indumentum externally as on pedicel, yellowish or yellow brown, internally glabrous but with a line of dense white curled simple hairs along lobe margins, densely papillate about base of columella. *Corolla* yellow, just exceeding calyx, 9–11 mm diam. in female and bisexual flowers, the male flower *c.* 7 mm diam. and apparently not opening as widely; petals spatulate, 4–4.5 mm long for male and female flowers, bisexual flowers to 6 mm long, 3.5–4 mm wide at widest part, ciliate at base, non-ciliate above, emarginate apically. *Staminal column* *c.* 1 mm long in female and bisexual flowers, 4–5.5 mm long in male flowers, pubescent with hairs similar to those on claw; stamens 18–20, sterile in female flowers, usually all fertile in bisexual and male flowers, rarely some sterile; anthers 0.5–0.6 mm long when fertile, 0.3 mm long when sterile. *Styles* in female flowers 3.5–4 mm long and longer than stamens at anthesis; in bisexual flowers 1.5–3.5 mm long, variable in height and development, usually eventually longer than stamens; in male flowers *c.* 1 mm long, much shorter than stamens; stigma discoid. *Schizocarp* 4.5–7.5 mm diam., depressed ovoid, often irregularly so, finely wrinkled to almost echinate, covered with dense sessile stellate hairs, deeply grooved between mericarps. *Mericarps* (4–)6–8, 2–3 mm high, often not all fully developed and very irregularly developed in bisexual plants, remaining attached to each other and falling as a whole with calyx attached; lateral wall (area of contact between adjacent mericarps) faintly reticulate. *Seed* *c.* 1–2 mm high, red-brown with sparse filamentous hairs. (Figures 1, 2)

Selected specimens examined. WESTERN AUSTRALIA: 27 miles W of Wiluna, 22 Aug. 1963, T.E.H. Aplin 2442 (PERTH); W of Wooleen HS which is *c.* 345 km SE of Carnarvon, 18 Aug. 1968, A.M. Ashby 2520 (AD, PERTH); Gt Northern Highway, 9 km S of Bulloo Downs H.S. turnoff, 27 Aug. 1995, R.M. Barker 1074 (AD); 19 km S of Wiluna, 13 Sep. 1978, A.C. Beaglehole 59519 & Errey 3219 (MEL, NT); 32 km SSE of Agnew, Leonora Rd, 14 Sep. 1978, A.C. Beaglehole 59742 & Errey 3442 (MEL, NT); Apus, Mileura Stn, Upper Murchison, 22 Aug. 1973, N.T. Burbidge 8119 & A. Kanis (CANB, PERTH); Menzies, Aug. 1899, D.W. Campbell *s.n.* (PERTH); 21.3 km NE of Paroo HS on Cunyu track, 16 Sep. 1986, R.J. Chinnock 7203 (AD); Mt Augustus, 22 July 1986, M.G. Corrick 9864 (MEL); 4 km SE of Murdaleda Bluff, Murgoo Stn, 27 June 1985, R.J. Cranfield 5242 (PERTH); Coolgubbin, *c.* 16 km S of Neale Junction, 21 May 1974, B.C. Crisp 54 (AD); Gascoyne River, 1882, J. Forrest *s.n.* (MEL); foot of Mt Magnet, 11 July 1931, C.A. Gardner & W. Blackall 52 (PERTH); Ganda, 63 miles SW of Warburton, 21 Aug. 1962, A.S. George 3791 (PERTH); Gannda Waterhole, Laverton Rd, 65 miles from Warburton Mission, 5 June 1973, U. Johnson 73/7 (NSW); Boundary Ridge Flats, 18.3 km ESE of Mt Meharry, 18 July 2000, S. van Leeuwen 4693 (AD, PERTH); Laverton, Sep. 1909, J.H. Maiden *s.n.* (NSW194364, NSW194365); 80 km N of Turee Creek HS, 13 June 1977, A.A. Mitchell 379 (PERTH); 3 km S of Meekatharra on S side of Sandstone Rd,

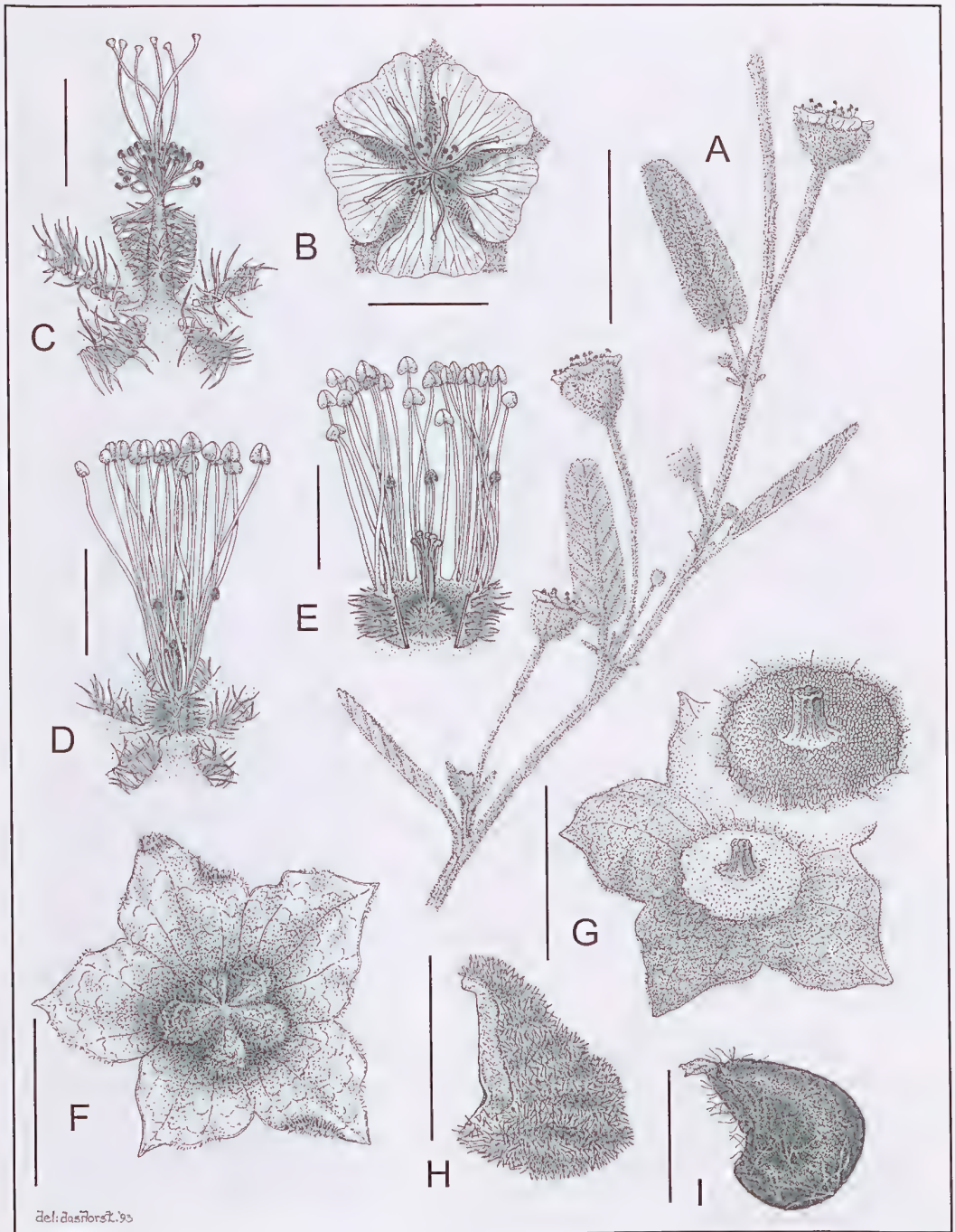


Figure 1. *Sida ectogama*. A – branch with male flowers; B – functionally female flower; C – staminal column with sterile anthers and long styles of female flower; D – stamens and staminal column of functionally male flower; E – opened staminal column of D to show styles which do not develop further on top of ovary; F – fruit and calyx, not all mericarps developing; G – fruiting calyx, mericarps removed to show glandular area which presumably produces nectar in flower; H – mericarp; I – seed. A from P.G. Wilson 7242 (PERTH); B–D from H.R. Toelken 6149 (AD); F–I from A.M. Ashby 3369 (AD). Scale bars: A= 25 mm; B= 5 mm; C–E, I= 2.5 mm; F, G= 17.5 mm; H= 4 mm.

16 Oct. 1984, *A.A. Mitchell* 1292 (CANB, PERTH); South Barlee Range, 7 Sep. 1959, *A. Robinson s.n.* (PERTH); 5 mls W of Meekatharra, 3 Sep. 1957, *N.H. Speck* 574 (CANB, PERTH); 165 km E of Ajana, which is c. 90 km N of Geraldton, 20 May 1966, *P.G. Wilson* 4153 (PERTH); Mt Leonora, c. 200 km N of Kalgoorlie, 26 Aug. 1968, *P.G. Wilson* 7242 (PERTH).

Distribution. *Sida ectogama* is found in drier areas south of the Pilbara region, mostly in an area bounded by Wiluna, Geraldton and Kalgoorlie and therefore mostly within the Murchison IBRA region (Figure 2D).

Ecology. *Sida ectogama* has been recorded from within mulga vegetation, in sand, loam or clay, often in rocky areas (including Banded Iron Formations), and almost invariably growing in the shade of taller bushes.

Phenology. Most flowering occurs from March to September, but it is dependent on rainfall; it is possible that bisexual flowers occur later in the flowering period but this needs to be looked at in the field.

Conservation status. A widespread and common species; no conservation code warranted.

Etymology. From *ecto-*, Greek for exposed, and *gamos*, Greek for marriage or union, a reference to the male and female flowers being on separate plants, a relatively unusual condition in the genus.

Notes. Earlier collections of *S. ectogama* were mainly identified as *S. calyxhymenia*. While this species shares the shrub habit and has similar leaves and a similar fruiting calyx, the fruiting calyx usually encloses the fruit rather than splaying open, the 5 enclosed mericarps are glabrous apart from some scattered glandular puberulent hairs (see above) compared with the 6–8 exposed and densely and persistently tomentose mericarps of *S. ectogama*. Furthermore the stamens and styles are included in *S. calyxhymenia* rather than exserted as in *S. ectogama* and flowers are bisexual on a bush rather than unisexual.

Clement (1957) cited at least one specimen (*Gardner* 2263) of *S. ectogama* in his concept of *S. calyxhymenia* var. *ferruginea*; the other specimens he listed under var. *ferruginea* belong with *S. calyxhymenia* and *S. petrophila*. Clement further noted that he had not seen any specimens of var. *ferruginea* and his concept of the variety was based on the description only. There were two type specimens cited in the protologue; the *W.J. George* collection has not been located and only a fragment of *Diels* 3269 has been seen. *Diels'* main collection in B was mostly destroyed in an air raid in 1943. While duplicates of other collections of his have been recorded from BM, MEL, NSW and PERTH, only a fragment in PERTH has been located to this time. This was sufficient to confirm its identification with this species.

Sida ectogama had been recognised as distinct, probably at least since the 1960s judging by the annotations *S. ciliata* N.T.Burbidge ms and *S. hirsutiflora* Fryxell ms on some PERTH specimens. W.R. Barker prepared a manuscript in the 1980s for a revised "Flora of Central Australia" which never eventuated. This manuscript was subsequently updated to a paper that has never been published (W.R. Barker, unpubl.). Within it are recognised a number of new *Sida* species with alphabetical designations; this species was referred to as sp. I and this annotation may be found on specimens, particularly in the State Herbarium of South Australia.

Holland and Reynolds (1988) included some specimens of *S. ectogama* in their concept of *S. asterocalyx*. However, *S. ectogama* differs from *S. asterocalyx* by its shorter styles (3.5–4 mm long compared with 5–9 mm long in female flowers), its shorter corolla lobes (4–6 mm long compared with 10–12 mm) and its exserted stamens and styles in flowers of the appropriate sex.

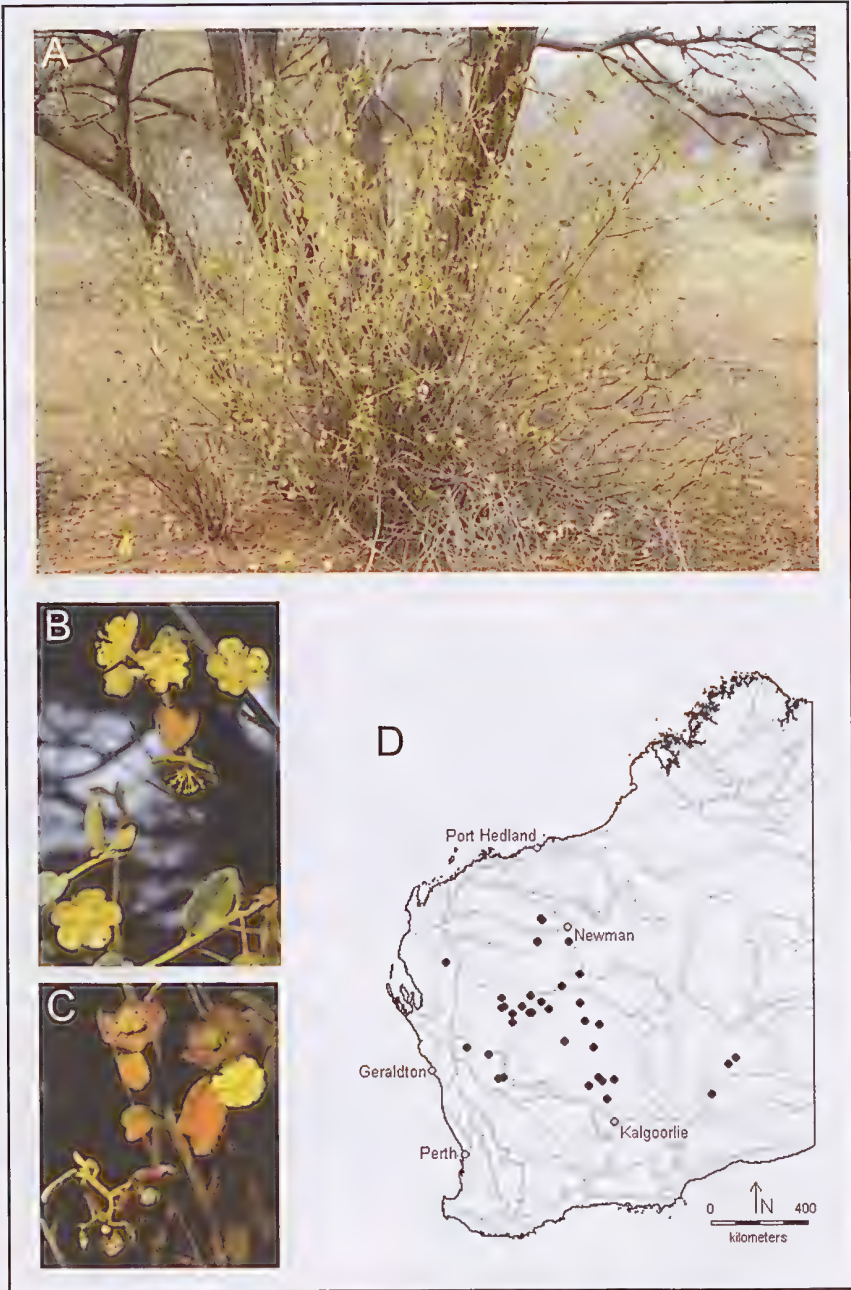


Figure 2. *Sida ectogama*. A – typical habit at the base of a larger tree; B – male flowers; C – female flower and fruits with persistent and enlarged calyx; D – distribution in Western Australia, based on PERTH specimen data, version 6.1 IBRA regions (Department of the Environment and Water Resources 2007) are indicated in grey. Photographs: W.R. Barker.

Sida arsiniata R.M.Barker, *sp. nov.*

Species nova, cum *Sida echinocarpa* et *Sida kingii* echinatis fructibus et inflatis calycibus optime congruens, sed rotundatis calycibus lobis differt.

Typus: c. 66 km by road south-south-west of turnoff to Wittenoom at Roy Hill on Great Northern Hwy, Western Australia, 17 August 1977, *W.R. Barker* 1962 (*holo*: AD; *iso*: AD, CANB, PERTH).

Sida sp. Wittenoom (W.R. Barker 1962), in G. Paczkowska & A.R. Chapman, West. Austral. Fl.: Descr. Cat. p. 293 (2000).

Sida raysmithii R.M.Barker ms, Western Australian Herbarium, in FloraBase, <http://florabase.dec.wa.gov.au> [accessed 28 March 2007].

Sida echinocarpa auct. non F.Muell., J.S. Beard, Descr. Cat. West. Austral. Plants, 2nd ed.: 85 (1965) *p.p.*

Small spreading shrub to 50 cm high; monoecious, indumentum of dense yellowish sessile or stalked stellate hairs, these sparser with age. *Leaves* alternate, discolorous, petiolate with blade narrowly elliptic to elliptic, usually 5–20 mm long but up to 45 mm long for older basal leaves, 3–10(–17) mm wide, base broadly cuneate or rounded, margin almost entire in younger leaves, crenate in older leaves, apex obtuse; upper surface olive green, reddish-brown or yellowish-brown, light greenish-white below; indumentum dense above and below; venation reticulate, impressed visible above, prominent raised below; petiole 5–10(–20) mm long, indumentum as on leaves. *Stipules* narrowly linear or narrowly triangular, 3–4.5 mm long, 0.1 mm wide, indumentum similar to that on petiole but somewhat sparser. *Inflorescence* terminal, racemose; flowers bisexual on any one bush. *Pedicel* 9–10 mm long in flower, 8.5–15 mm long in fruit, articulated in lower half, with dense sessile and stalked stellate hairs above and below but appearing sparser below by shorter hairs; upper part deciduous with calyx, lower part persistent. *Bud* ovoid to urceolate, 5-winged, erect. *Calyx* widely cup-shaped in open flower, larger and persistent in fruit, not membranous and partially enclosing fruit; lobes joined in lower half, free part 3–4.5 mm long and 3–4.5 mm wide in flower, 5.5–6 mm long in fruit, transversely ovate, apices rounded or obtuse but with tiny apiculum; indumentum externally yellowish-white, as on pedicel, internally with moderately dense few-armed sessile stellate hairs in exposed part, otherwise glabrous and without obvious papillae at base of columella. *Corolla* yellow throughout, similar length to calyx, 7–9 mm diam.; petals obovate, 3–4 mm long, 2–3 mm wide at widest part, ciliate on narrowed base, asymmetrically obcordate apically. *Staminal column* 0.5–1.5 mm long, glabrous; stamens c. 16–17; anthers 0.2–0.3 mm long. *Styles* 8–10, longer than stamens; stigma discoid. *Schizocarp* 5.5–6 mm diam., transversely elliptic, echinate, glabrous except for sparse to moderately dense glandular puberulence on spines, not or hardly grooved between mericarps. *Mericarps* 9 or 10, 1.5 mm high, shallowly grooved apically, probably remaining attached to each other and falling as a whole with calyx attached; lateral wall (area of contact of adjacent mericarps) rough with muricate surface. *Seed* 1.5 mm high, smooth, red-brown, glabrous. (Figures 3, 4)

Specimens examined. WESTERN AUSTRALIA: 718.2 miles along North West Coastal Hwy, 31 July 1971, *A.M. Ashby* 3907 (AD, PERTH); c. 1210 km along North West Coastal Hwy, 1 Aug. 1971, *A.M. Ashby* 3913 (AD); 757.8 miles along North West Coastal Hwy, 1 Aug. 1971, *A.M. Ashby* 3920 (AD, PERTH); near Dingo Bore on Boolgeeda Track, Lawloit Range, 4 km E of Duck Creek HS (abandoned), W Hamersleys, 3 Aug. 1999, *B. Backhouse*, *D. Edinger* & *G. Marsh* BEM 225 (PERTH); Newman – Marble Bar Rd, 63.6 km from Great Northern Hwy Turnoff, 28 Aug. 1995, *R.M. Barker*

1089A (AD); Tom Price – Mt Brockman Rd, 14.1 km N Hamersley turnoff, 67.7 km S of junction with Millstream – Wittenoom Rd, 31 Aug. 1995, *R.M. Barker* 1135 (AD); NW Coastal Hwy, 14.5 km SW of Yannarie River bridge, 34.4 km NE of Burkett Road turnoff, 4 Sep. 1995, *R.M. Barker* 1171 (AD); North West Coastal Hwy, c. 15km by road SSW of Fortescue River crossing, 27 Aug. 1977, *W.R. Barker* 2129 (AD, duplicate to be distributed); 35 mls E of Wittenoom, 4 Sep. 1959, *W.H. Butler s.n.* (PERTH); near Nickol Bay, 1898, *W. Cusack s.n.* (MEL53692); near Soak Bore, Peedamulla Station near Onslow, 15 Sep. 1996, *A.A. Mitchell* PRP1656 (AD, PERTH).

Distribution and ecology. Found in the Pilbara region of Western Australia where it is usually associated with red sand dunes and spinifex. It is probably more widespread than the collections listed here indicate (Figure 4B).

Phenology. Flowering is usually August to September.

Conservation status. Previously listed by Atkins (2006) as Priority Three according to Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora, under the phrase name *S. sp.* Wittenoom (W.R. Barker 1962). No longer considered to be at risk.

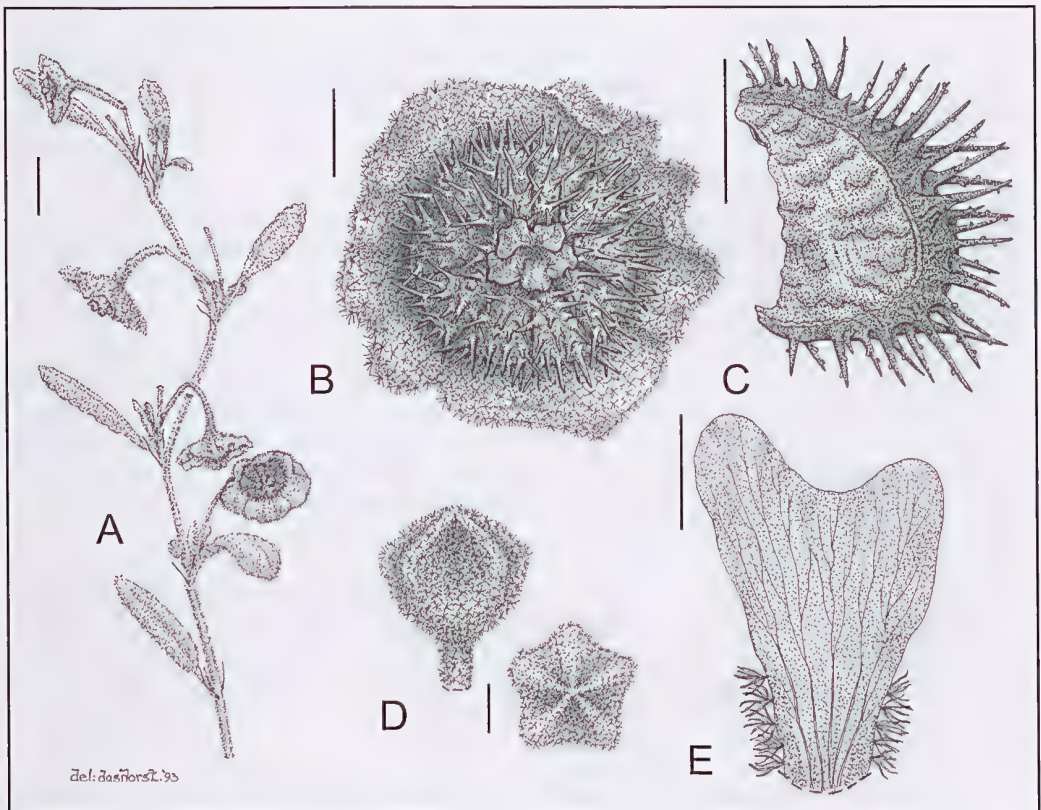


Figure 3. *Sida arsinata*. A – fruiting branch; B – fruit and calyx with flower remnant present in middle of fruit; C – mericarp, lateral view, note glandular puberulence on spines; D – buds, side and top view; E – petal. A–C from *W.R. Barker* 2129 (AD); D, E from *A.M. Ashby* 3907 (AD). Scale bars: A = 10 mm; B = 2.75 mm; C, D = 1.5 mm; E = 1 mm.

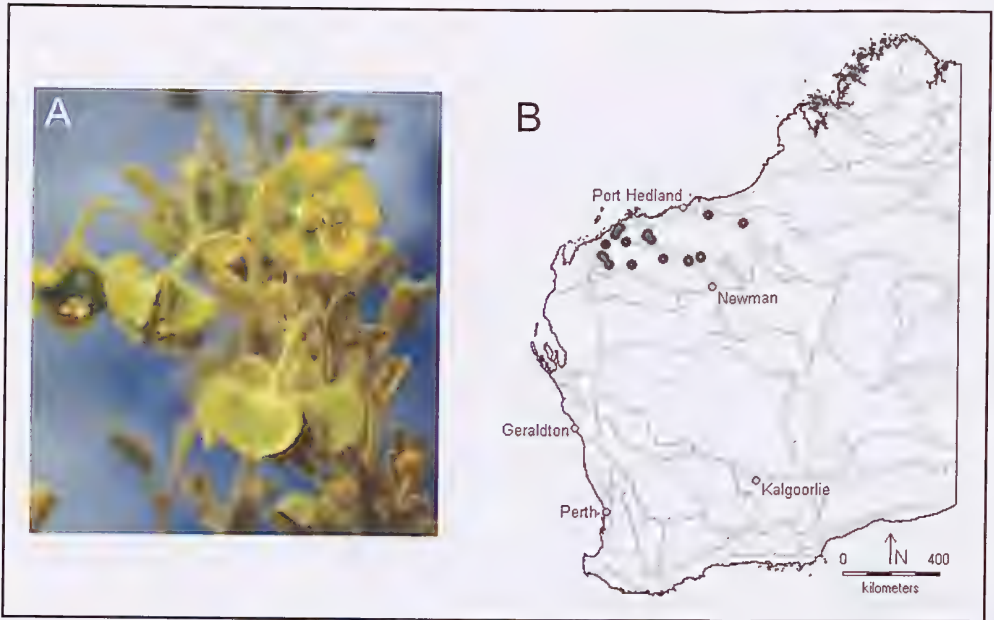


Figure 4. *Sida arsinata*. A – branches, showing bud with calyx and fruits surrounded by persistent calyx; B – distribution in Western Australia, based on PERTH specimen data, version 6.1 IBRA regions (Department of the Environment and Water Resources 2007) are indicated in grey. Photograph: W.R. Barker.

Etymology. *Arsinium* is Latin for a woman's head-dress (Brown 1956); the addition of the suffix *-ata* indicates a likeness (Stearn 1992). The epithet is a reference to the distinctive shape of the subtending calyx about the fruit, mentioned above as being similar to a 17th or 18th Century woman's mob-cap.

Distinguishing features and relationships. The species is easily confused with *S. echinocarpa* and the two species may grow together; they both have echinate mericarps which may be glabrous or puberulent, but *S. echinocarpa* has longer, acute calyx lobes. In contrast, the calyx lobes of *S. arsinata* are short and rounded so that the calyx surrounding the mature fruit resembles somewhat an old-fashioned mob cap (Figure 7). *Sida kingii* shares the spiny fruits and inflated calyces of *S. arsinata* and *S. echinocarpa*, but differs from both species by its pubescent fruits; it also has distinct calyx lobes as in *S. echinocarpa*.

Notes. Buds and flowers of *S. arsinata* are held erect, the flowers being open in the morning to early afternoon. Fruits are pendent and the expanded calyx is dispersed with the fruit, as with a number of native Australian *Sida* species in which the calyx expands in fruit. While the young fruits are green the calyx is also green but with aging of the fruit to brown, the calyx dries somewhat and also adopts a brownish colour.

Ray Smith of the National Herbarium of Victoria recognized and annotated the Cusack specimen in MEL as different in 1960. He annotated the specimen as "*Sida* sp. aff. *S. echinocarpa* F. Muell." and noted the difference of the Cusack specimen from the type of *S. echinocarpa* in the "shape of calyx lobes, carpel number, leaf shape etc. Probably a related though undescribed species." On this basis Fryxell annotated this same sheet as "*Sida smithii*" and for some time the manuscript name "*Sida*

raysmithii” had been used. However, it was decided that the shape of the calyx lobes in relation to the fruit was so characteristic that a name reflecting this distinction was more appropriate.

Acknowledgements

Much of the early work documenting the species of *Sida s. lat.* in Australia was supported by grants from the Australian Biological Resources Study. Thanks to the Australian herbaria for their patience in allowing extended loans of their *Sida* specimens to the State Herbarium of South Australia. Thanks to the State Herbarium of South Australia for allowing access to artist, Gilbert Dashorst, who prepared the line drawings. Both of the species described here were seen on a field trip to Western Australia in 1995 with Philip Short, then of the National Herbarium of Victoria, and Bill Barker of the State Herbarium of South Australia. Bill Barker’s revised manuscript for the *Flora of Central Australia* (W.R. Barker unpubl.) drew attention to the many new taxa of *Sida* in Australia and the need for a thorough treatment across Australia; the Latin diagnosis for *S. ectogama* is from that manuscript.

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